CLAIMS

1) A device intended to emit waves in an underground formation, comprising at least one vibrator including two slabs (2, 3), at least one motive element (1) suited to generate vibrations and to communicate them to the slabs, and a generator (6) for applying periodic control signals to the motive element, characterized in that the vibrator is positioned in a well or cavity (W) and embedded in at least one solid material (7, 10) providing coupling thereof with the underground formation, this material being in contact with the two end plates (2, 3) over at least part of each of the respective faces thereof.

2) A device as claimed in claim 1, characterized in that it comprises anchor bars (9) associated with at least one of the slabs (2, 3) to increase coupling of the vibrator with the mass (7, 10) of coupling material

3) A device as claimed in claim 1, characterized in that each slab comprises at least two plates (2a, 2b) arranged at a distance from one another and connected by anchor bars (9).

4) A device as claimed in claim 2 or 3, characterized in that the outer surface of each slab is provided with an uneven relief such as grooves to increase the area of coupling of the device with coupling material (7, 10).

5) A device as claimed in any one of claims 2 to 4, characterized in that the anchor bars are provided with an uneven relief to increase the area of coupling of the device with coupling material (7, 10).

6) A device as claimed in claim 1 or 2, characterized in that the slabs (2, 3) are perforated so as to facilitate penetration of the coupling material in the space contained between the two end plates (2, 3).

7) A device as claimed in any one of the previous claims, characterized in that it comprises a single solid coupling material distributed so as to provide coupling of the vibrator with the formation, at least at the opposite ends thereof.

8) A device as claimed in claim 7, characterized in that it comprises at least two coupling materials, a first material (7a, 7b) being distributed in two distinct masses to provide coupling of the vibrator with the formation, at the opposite ends thereof, and a second material (10) being inserted between the two masses.

9) A device as claimed in any one of the previous claims, characterized in that it comprises several vibrators (V1,..., Vn) connected to a signal generator (6), these vibrators being arranged at intervals in relation to one another along a well (W) and all embedded in at least one coupling material (7, 10).

10) A device as claimed in claim 9, characterized in that it comprises a control box (14) inserted between vibrators (V1,..., Vn) and signal generator (6) allowing them to be triggered successively.

11) A device as claimed in any one of claims 9 or 10, characterized in that it comprises a seismic receiver (R) coupled with the formations surrounding the well at a determined depth and connected to an acquisition and processing unit (15) suited for sequential control of the vibrators so as to obtain an emission oriented mainly according to a predetermined pattern.

12) A device as claimed in any one of claims 9 or 10, characterized in that it comprises seismic receivers (G1) associated with the various vibrators (V1) and connected to an acquisition and processing unit (15) suited to determine the traveltimes of the waves between the locations of the various vibrators and to control them sequentially so as to obtain an emission oriented mainly according to a predetermined pattern.

13) A device as claimed in claims 2 and 12, characterized in that receivers (G1) are fastened to supports (16) secured to anchor bars (9).

14) A device as claimed in any one of the previous claims, characterized in that each vibrator comprises a pillar (1) of sensitive elements coated with a protective sheath (4), said coupling material being in contact with protective sheath (4) and with the two slabs (2, 3) over at least part of each of the respective faces thereof.

15) A device as claimed in claim 14, characterized in that the space between the sheath and the pillar of sensitive elements is filled with a liquid such as oil.

16) A device as claimed in claim 14, characterized in that pillar (1) consists of piezoelectric or magnetostrictive sensitive elements.

17) A device as claimed in any one of claims 1 to 13, characterized in that each motive element is of electromechanical, electromagnetic or hydraulic type.

18) A method of generating in an underground formation vibrational signals according to an oriented emission pattern, characterized in that it comprises :

- installing in the same well (W) several vibrators (V1,..., Vn) comprising each two slabs (2, 3), at least one motive element (1) suited to generate vibrations and to communicate

them to the plates and a generator (6) for applying periodic control signals to the motive element, each vibrator being positioned in a well or cavity (W) and embedded in at least one solid material (7, 10) providing coupling thereof with the underground formation, this material being in contact with the two slabs (2, 3) over at least part of each of the respective faces thereof, and

- sequentially controlling the various vibrators (V1,..., Vn) by means of a control box (10) with time lags between the respective triggering times that depend on the intervals between the locations of the vibrators and the velocity of propagation of the waves in the formations surrounding the well, so as to obtain a directive emission.

19) A method as claimed in claim 18, characterized in that sequential control of the vibrators comprises applying to the vibrators control signals at a fixed frequency f whose phase Φ_i is related to said frequency f and to said time lag by the relation $\Phi_i = 2\pi.f.t_i$.

20) A method as claimed in claim 18, characterized in that sequential control of the vibrators comprises applying to the various vibrators control signals of distinct fixed frequencies so as to allow separation thereof.

21) A method as claimed in any one of claims 18 to 20, characterized in that it comprises coupling with the formation surrounding the well of a seismic receiver (R) and prior determination of the traveltimes of the waves respectively between each vibrator and said receiver (R).

22) A method as claimed in any one of claims 18 to 20, characterized in that it comprises adding to the vibrators receivers (R, G1) connected to a signal acquisition and processing unit (15) and sequential triggering of the various vibrators with time lags

between the respective triggering times calculated by said unit (15) by calculating the time lag between the signals produced by the various receivers.